[Proc. Roy. Soc. Victoria, 44 (N.S.), Pt. I, 1932.]

# Art. II.—*The Development of the Tabulate Coral, Pleurodictyum megastomum.*

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[Read 9th April, 1931; issued separately 29th February, 1932.]

## Introduction.

The species dealt with in this paper was established by W. S. Dun (Dun, 1898, p. 83, pl. iii, fig. 1) on fragments from Kilmore and Mansfield. Though Sir Frederick McCoy (McCoy, 1867, p. 201, footnote) at an earlier date had recorded from the Upper Yarra district a form he called *Pleurodictyum megastomum*, he had not described it. The description of the first complete corallum under this name was made by F. Chapman (Chapman, 1903, p. 105, pl. xvi, figs. 2-5), who described from the junction of the Woori Yallock and the Yarra a specimen showing 14 corallites. It is interesting to note, however, that as early as 1888 Dr. Foerste (Foerste, 1888, p. 132, pl. xiii, fig. 22) had described a similar specimen with 15 corallites, referring it with some doubt to the European species, *Pleurodictyum problematicum* Goldfuss. Mr. Chapman made a further contribution to our knowledge of this species in 1921 (Chapman, 1921, p. 216, pl. ix, figs. 4, 5, 6) by describing an eight-celled form from Kinglake West. Specimens recently collected from the same district by the author, together with material and figures from other sources, indicate that the number of cells can range from 6 to 15. At the same time, these specimens make clear the stages of development in this interesting species, and demonstrate a parallelism in this regard with the American species, *Pleurodictyum lenticulare*.

## Development of Pleurodictyum lenticulare.

C. E. Beecher (Beecher, 1891) has been able to establish the mode of development of the American species, *Pleurodictyum lenticulare* (Hall) (=*Michelinia lenticularis* Hall) (Hall, 1887), which occurs in the Lower Helderbergian (Lower Devonian) of New York State. He was fortunate enough to obtain a specimen of the initial corallite (Fig. 1*a*), and one showing the second corallite budding off from it (Fig. 1*b*), thus establishing the nepionic and the first ncalogic (or neanic) stages in growth. The succeeding neanic stages up to the eighth corallite he elucidated by an examination of an excellently preserved epitheca (Figs. 1*c* and 1*d*). From this, by means of the growth lines and the relative sizes of the corallites, he was able to demonstrate the origin of the first and second buds near the apex of the initial corallite, and to show that succeeding buds originate respectively further away. In the absence of an

epitheca, Beecher found the relative sizes of the corallites, up to the completion of the eighth, a reliable guide to their order of development (Fig. 1*e*).

### Development of Pleurodictyum megastomum.

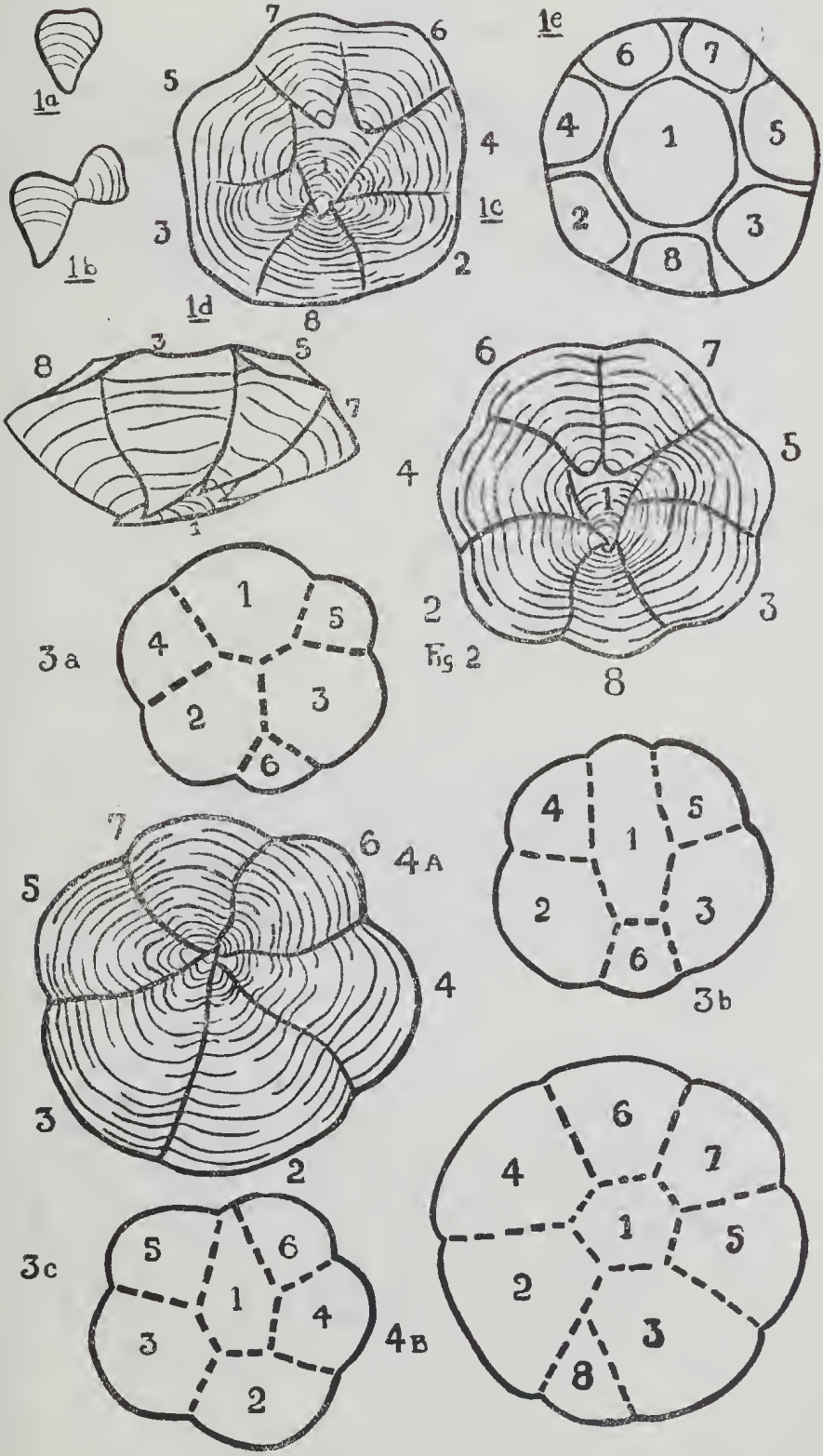
The application of these principles to the Victorian species shows a close relationship with the American. Fig. 2 shows an epitheca of *P. megastomum* from Kinglake West, from which the order of development of the first eight corallites can be clearly seen to be similar to the American species.

A departure from these principles is shown in Figs. 3*a* and 3*b*, which are views of the upper surface of two 6-celled specimens. If relative size is taken as a sure indication of order of development, then the sixth corallite has grown in the normal position for the eighth. As there seems no reason for doubting the above rule, this mutation probably represents an adaptation to some new feature of the environment. A second abnormality is shown in Fig. 3*c*. The second and third corallites appear to have grown from the calyx of the initial corallite instead of the apex. If so, the specimen is comparable with Fig. 1*b* for *P. lenticulare;* but it could just as well be an appearance due to the partial obscuring of the calicular end of the initial corallite by the fifth and sixth corallites. That the latter process does occur is shown by Fig. 4*a*, in which the first corallite is totally obscured.

Figs. 4*a* and 4*b* are two later stages, showing the successive development of a seventh and eighth corallite respectively in the position already established from Fig. 2.

No specimens are available to show the successive addition of corallites from the second to the sixth, but possibly further search will yield these, or an ancestral form which *P. megastomum* could be expected to recapitulate in the course of its development. *P. lenticulare* appears to have an ancestral form, *P. trifoliatum* Dunbar (Dunbar, 1920, p. 118, pl. i, figs. 5-7), reaching maturity, as the name indicates, at the three-celled stage. *P. trifoliatum* is found at the base of the Lower Helderbergian in Western Tennessee, where *P. lenticulare* is abundant in the overlying Lower Helderbergian rocks. The two species are definitely allied by the rounded cross-section of the conical corallites, which is in contrast to the polygonal, commonly trapezoidal, shape seen in the Victorian form.

In the American species, after the completion of the eighth corallite, the corallum enters upon an ephebic or mature stage, wherein it enlarges, without the addition of further corallites, to about twice its diameter. It is obviously difficult to establish the existence of a stage of this type without a large number of specimens, for one cannot be sure whether an observed variation in size among a number of specimens is indicative of stages in growth, or is the normal range one would expect among mature

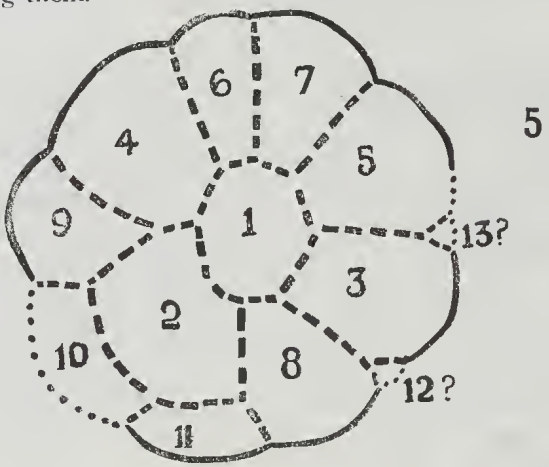





TEXT FIGURES 1—4

members of a particular species. With a limited number of specimens, it is not surprising therefore that this stage has not been established with certainty for our Victorian species, though it is highly improbable that it is absent.

The gerontic stage, or old age (Fig. 5) is marked by the addition of a second outer ring of corallites, which grow in a highly irregular manner, so that no definite plan of budding can be discerned among them.

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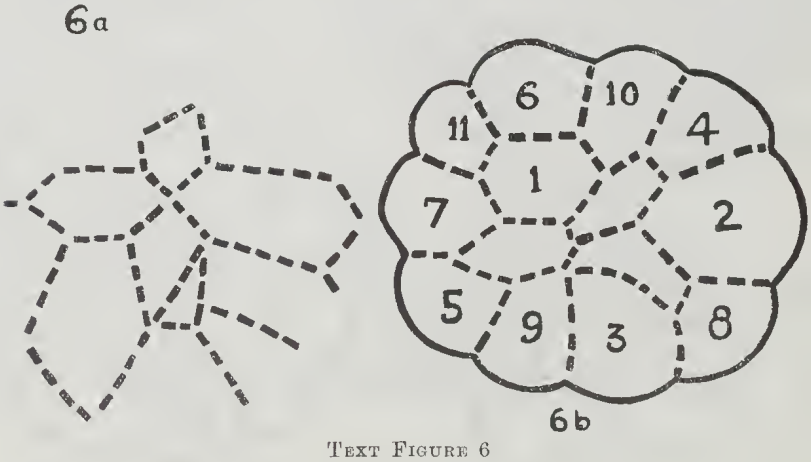
A frequent feature in this stage is the insertion of two or three additional corallites in the centre of the corallum. Their origin is best explained by intermural gemmation, such as occurs in *Favosites,* after the individual begins vertical growth. Such corallites are, to begin with, characteristically triangular in cross-section (Fig. 6*a*) ; but become more of a regular polygonal shape later, owing to compression (Fig. 6*b*). Their occurrence is indicative of the close natural affinity between *Pleurodictyum* and *Favosites.*

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Central corallites characterize the gerontic stages not only of *P. megastomum*, but also of *P. lenticulare*, as pointed out by James Hall (*op. cit.*, p. 7). The central corallites in the latter are usually two, and in the former three or four.

It is significant that it is the gerontic stages of these two species which exhibit the closest parallelism. Hyatt (Hyatt, 1895) has observed that this is usually the case with species derived from a common stock, and conversely, of course, its existence is strong proof of a common ancestry. He states (p. 89): "In the young, hereditary similarities derived from more or less remote ancestors are repeated, but these are more and more overgrown and replaced by more recently acquired characteristics as the adult period is approached. In old age, these more recently acquired characteristics disappear, and in consequence of their disappearance, certain parts of the body, and finally the whole body, assume aspects which can be more or less closely compared with those of the same parts and of the entire body in the young, before the differential characteristics of the adolescent and adult periods arose."

## Summary and Conclusion.

Summarizing, the mode of development of *Pleurodictyum megastomum*, a tabulate coral from the Silurian (Yeringian) of Victoria, has been investigated. The stages are:

(1) a neanic stage, completed when the central corallite has been surrounded by seven peripheral corallites according to a definite plan,

(2) an ephebic stage, during which the form enlarges to adult size, and

(3) a gerontic stage, in which corallites are added and enlarged in an irregular manner.

This mode of growth is shown to be similar to that of the American species, *Pleurodictyum lenticulare*, which is found in the Lower Helderbergian. The result, besides proving of palaeontological interest, should be of value in establishing the homotaxial relationships between the Victorian and North American rocks of Silurian and Devonian age.

In conclusion, it is with pleasure that I take this opportunity of acknowledging my indebtedness to Mr. F. Chapman and Mr. R. A. Keble, for their encouragement and practical assistance in my work at the National Museum. I should like to thank Professor Skeats and Dr. Summers, who have been good enough to give me facilities for work at the Geology School of the Melbourne University; and also Mr. F. Singleton for his interest, and the loan of some specimens from the University Collection.

## Bibliography.

Allan, R. S., 1929. The Significance of the Genus *Pleurodictyum* in the Palaeozoic Rocks of New Zealand. *Trans. and Proc. New Zealand Institute*, lx, (2), pp. 320-323.

Beecher, C. E., 1891. The Development of a Palaeozoic Poriferous Coral. *Trans. Connect. Acad. Arts and Sci.*, viii, pp. 207-212, pls. ix-xiii.

Chapman, F., 1903. New or Little-known Victorian Fossils in the National Museum, Melbourne: Part I, Some Palaeozoic Species. *Proc. Roy. Soc. Vict.*, xv (n.s.), (2), pp. 104-122, pls. xvi-xviii.

————, 1921. New or Little-known Victorian Fossils in the National Museum, Melbourne: Part XXV, Some Silurian Tabulate Corals. *Ibid.* xxxiii (n.s.), pp. 212-225, pls. ix-xii.

Dun, W. S., 1898. Contributions to the Palaeontology of the Upper Silurian of Victoria, based on specimens in the Collections of Mr. Geo. Sweet, Part I. *Ibid.* x, (n.s.), (2), pp. 79-90, pl. iii.

Dunbar, Carl. O., 1920. New Species of Devonian Fossils from Western Tennessee. *Trans. Connect. Acad. Arts and Sci.*, xxiii, pp. 109-158, pls. i-v.

Foerste, A., 1888. Notes on Palaeozoic Fossils from Australia, Ohio, and New Brunswick. *Bull. Sci. Lab. Denison Univ.*, iii, pp. 117-137, pl. xiii.

Hall, James, 1887. Natural History of New York, Palaeontology, Vol. VI (Corals and Bryozoa), p. 7, pl. iii, figs. 1, 2, 3, 5.

Hyatt, A., 1895. Bioplastology and the Related Branches of Biologic Research. *Proc. Boston Soc. Nat. Hist.*, xxvi, pp. 59-125.

McCoy, F., 1867. On the Recent Zoology and Palaeontology of Victoria. *Ann. Mag. Nat. Hist.*, Third Series, xx, pp. 175-202.

## Explanation of Figures.

With the exception of figure 1, all figures are based on specimens from the Silurian of Victoria. Numbers in brackets refer to collections in the National Museum, Melbourne.

Fig. 1.—Development of *P. lenticulare* (after Beecher). a—nepionic stage (epitheca); b—first neanic stage (epitheca); c—completed neanic stage (epitheca); d—the same stage, side view; e—the same stage, upper view of corallites. × 2.

Fig. 2.—Development of *P. megastomum*. Epitheca, showing completed neanic stage. From Silurian (Yeringian), Carman's Quarry, 2 miles below Tommy's Hut, Kinglake West, on east side of road to Whittlesea. (13643.) × 2.

Fig. 3.—Development of *P. megastomum* at six-celled stage, as seen from upper surface. a—showing abnormal position of sixth corallite. From Silurian (Yeringian), Kinglake West. (13640.) b—another abnormal position for the sixth corallite. From same district, MacPherson's Quarry, about ¾ mile north-east of Tommy's Hut. (13641.) c—the second and third corallites here seem to have developed from calyx of first corallite, instead of apex (cf. fig. 1b). From Silurian (Yeringian), Kinglake West. (13642.) Natural size.

Fig. 4.—Development of *P. megastomum* at seven- and eight-celled stages. a—epitheca, showing position of growth of seventh corallite. The initial corallite has been obscured by development of later ones. From above district, in quarry about ½ mile below Tommy's Hut, and short distance east of road to Whittlesea. (13644.) b—view of upper surface of another specimen, showing position of growth of eighth corallite. From above district. (13186.) Figured by F. Chapman, 1921 (*op. cit. supra*). × 2.

Fig. 5.—Development of *P. megastomum*. Beginning of gerontic stage, showing second ring of corallites and irregular growth from seventh corallite on (348). From Silurian (Yeringian), 1½ miles below Simmons' Bridge Hut on Yarra, Geol. Surv. Loc. B 16. × 2.

Fig. 6.—Development of *P. megastomum.* a—portion of gerontic specimen, showing a triangular corallite inserted by intermural gemmation. Specimen (342) from Silurian (Yeringian) at junction of Woori Yallock creek and Yarra, Geol. Surv. Loc. B 23. b—a large gerontic specimen showing a possible mode of development. The corallites not numbered appear to have originated by intermural gemmation. Specimen (340) from Silurian (Yeringian) at same locality B 23. Figured by F. Chapman, 1903 (*op. cit. supra*). Natural size.